

97 00956

Ground Level Ozone and Stratospheric Ozone

INSTITUTE OF GOVERNMENTAL
STUDIES LIBRARY

OCT 13 1997



**Bay Area Air Quality
Management District**
939 Ellis Street
San Francisco, CA 94109
(415) 771-6000

What Is The Bay Area Air Quality Management District?

The Bay Area Air Quality Management District (District) is the regional agency in the Bay Area that regulates stationary sources of air pollution such as factories, industrial sites and gasoline stations. The District has jurisdiction in nine counties – Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara, Marin, Napa, southwest Solano and southern Sonoma. District regulations control such things as open burning, incineration, smoke, odors, gasoline, paint and other evaporative compounds.

The District receives many inquiries from the public concerning ozone pollution and the well-publicized holes in the ozone layer. A lot of people are confused as to how ozone can be both good and bad. This brochure contains information which should clear up some of the confusion.

Ozone In The Troposphere (At Ground Level)

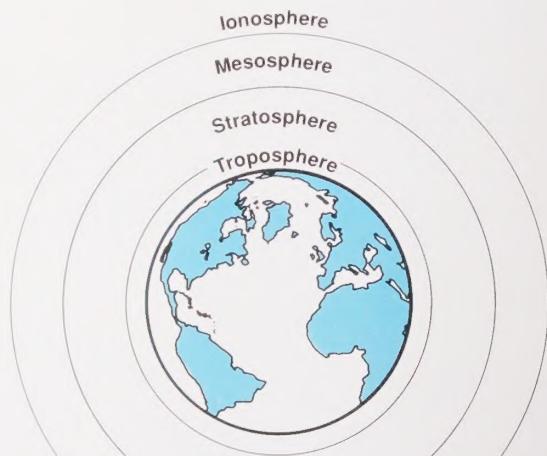
Ozone is a colorless, pungent,* toxic gas. It is the by-product of automotive and industrial emissions and as such has become the most serious and persistent air quality problem in the Bay Area. Chemically, it is a derivative of oxygen, the gas we breathe for life. While the oxygen molecule contains two oxygen atoms, ozone contains three.

Ozone gas is not emitted directly into the atmosphere from industrial stacks or the tailpipes of cars, but rather is produced by a complex series of photochemical reactions between reactive organic compounds (gasoline, paints, solvents) and oxides of nitrogen (fuel burning sources). Essential to this photo-chemistry is hot, sunny, windless weather.

* it is odorless at concentrations found in the ambient air

The health effects of ozone are well-documented. It causes eye irritation and affects the respiratory system by severely irritating the mucous membranes of the nose and throat. Normal functioning of the lungs is impaired, thus reducing the ability to perform physical exercise. Of course, the effects are more severe on individuals with chronic lung disease such as asthma and emphysema on the very young and the very old, and on athletes.

An air quality standard for ozone, established by the federal Environmental Protection Agency, is designed to protect the health of sensitive persons. The state of California has adopted an even more stringent ozone standard. There is an ongoing aggressive program to reduce the emissions which cause the formation of ozone.



Ozone In The Stratosphere (The Upper Atmosphere)

In contrast, ozone found 15 to 35 miles above the earth is essential to life. It is the same colorless, pungent, toxic gas, but in the upper atmosphere, the diffuse layer of ozone encircling the planet screens out the most damaging ultraviolet (UV) rays of the sun. Without that protection, life as we know it could not survive.

The formation of ozone in the stratosphere results from the action of UV rays from the sun on molecules of oxygen gas present in the stratosphere. Thus the process is quite different from the way ozone is formed at ground level. Upper atmospheric ozone does not reach the surface of the earth, but is generally maintained as a layer about 15 to 35 miles above the surface of the earth. Nor can ground level ozone replenish the depleted ozone in the stratosphere. It does not drift that high and in any case, it reverts back to oxygen within a few days after it has formed. Ground level ozone does not act as a shield from UV radiation either as the amounts that cause local air pollution problems are too small to offer such protection.

The earth is constantly being bombarded by the sun's light rays. All of the most damaging rays (called UV-C) are blocked by the ozone layer, but millions of cases of skin cancer are caused every year by overexposure to other rays (called UV-B), some of which do get through the shield. The prospect of more UV-B light getting through is the reason that the holes in the ozone layer over the Antarctic and to a lesser extent, the Arctic, are of great concern.

What Causes Holes In The Ozone Layer?

Chemicals once thought to be benign are now known to be attacking the ozone layer. The chemicals are called chlorofluorocarbons (CFCs) which are widely used in industrial and consumer products such as refrigerators and air conditioners, plastic foams and insulation and as solvent cleaning agents for many types of high-tech equipment. They are a family of highly stable, nontoxic, nonflammable, noncorrosive chemicals. And they are relatively simple and cheap to manufacture.

The stability of CFCs is what enables them to drift to the stratosphere unaltered. It takes several years for the compounds to rise through the ozone layer to where they are bombarded

by UV radiation and broken down into chlorine, fluorine and carbon. Then the damage begins. Chlorine atoms attack the ozone molecules and each atom can destroy up to 100,000 ozone molecules. For every one percent drop in ozone, there is a two percent increase in UV-B light intensity at the earth's surface. Any prolonged increase could set in motion far-reaching and not entirely predictable ecological changes. For instance, microscopic plants and animals at the beginning of the food chain have little protection against UV-B radiation.

Expected health effects from further depletion of stratospheric ozone would be an increase in all forms of skin cancer and painful inflammation of the cornea of the eye similar to snowblindness. On the speculative side, there have been suggestions that the immune system processes may be affected.

The chart below illustrates the usage of CFCs throughout the United States.

CFCs In The U.S. By Percent

Solvents: Electronics, degreasers, dry cleaners

Rigid foam: Packaging materials, insulation, flotation equipment

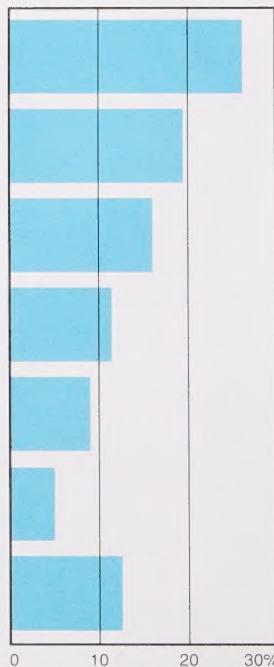
Air-Conditioners: Motor vehicles

Fire Extinguishers: Home, office, mobile

Refrigeration: Refrigerators and freezers for the home, refrigeration for the railroad and trucking industries

Flexible foam: Mattresses, pillows, upholstery, motor vehicle seats, pads for rugs and carpets

Miscellaneous



What Does The Future Hold?

Now that the connection between ozone depletion and CFCs is a solid one, there is international support gathering for aggressive action to be taken. It is recognized throughout the industry that a phase-out is necessary. For instance, the largest producer in the United States, Du Pont, intends to cease manufacture of CFCs by the end of the century. American Telephone cut emissions of CFCs in half by 1991 and intends to eliminate all CFC emissions from its factories by 1994. Japan's Nissan Motors has said it will totally ban CFC use by 1993. The European Economic Community countries recently voted to eliminate all CFC production by the end of the century and to cut production by 85 percent as soon as possible.

It should be pointed out that depletion of the ozone layer would continue for several years after phase-out of CFCs because of the length of time it takes the compounds to reach the upper atmosphere.

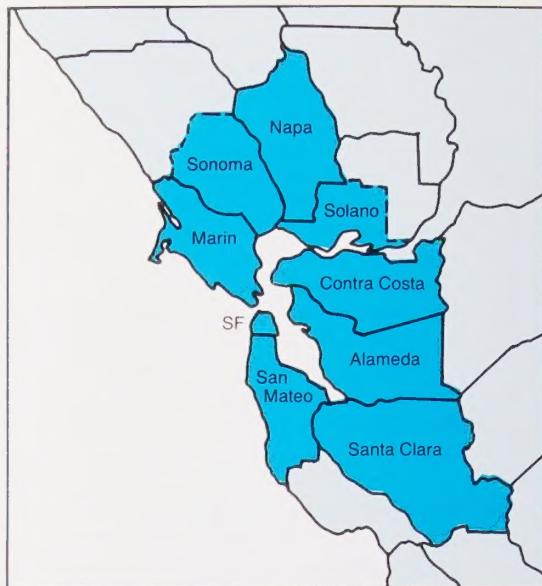
How Can The Public Help?

Consumers can help by insisting that their auto air conditioner coolant be recycled during servicing as soon as the recycling units begin to appear in auto shops.

Recycling programs will also be developed in the near future for CFC coolant used in refrigeration.

Dry chemical fire extinguishers are adequate for most home uses and these could be used in place of the halon type which can contribute to ozone depletion.

Consumers should check labels before buying items such as VCR-head cleaners and film-negative cleaners as some of these products are being reformulated without CFCs.



Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109



Air Quality Conditions,
Written Information,
Burn Day Forecast

1 (800) HELP-AIR

Complaints

1 (800) 334-ODOR

Report Smoking Vehicles

**1 (800) EXHAUST
(394-2878)**

Public Information Office

(415) 749-4900

All Other Calls

(415) 771-6000

U.C. BERKELEY LIBRARIES



C124919388

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109